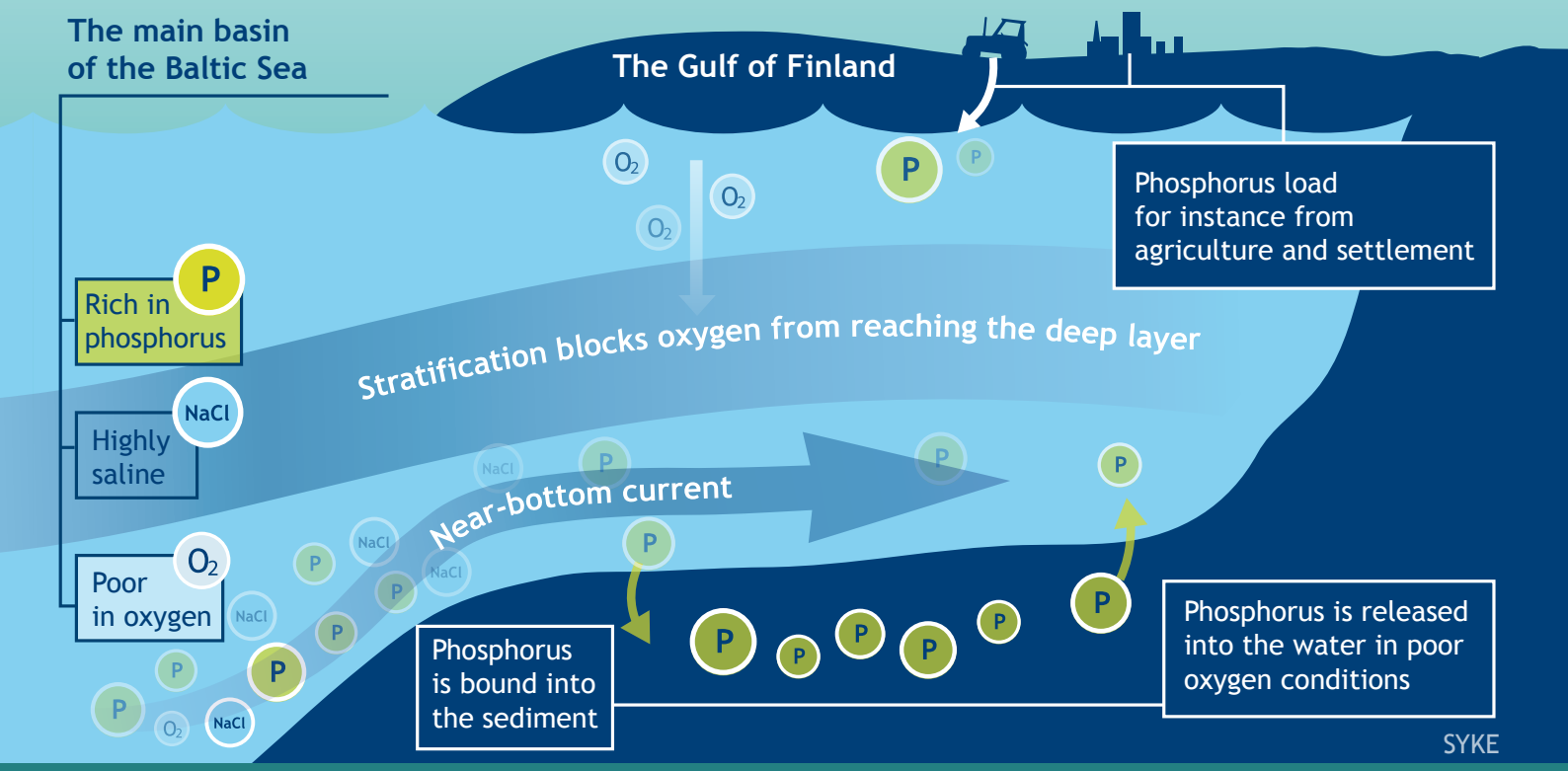
The Gulf of Finland is gradually recovering

The Gulf of Finland still suffers from environmental problems, although much effort has been put to the improvement of its condition in recent decades. However, a change for the better is already happening.

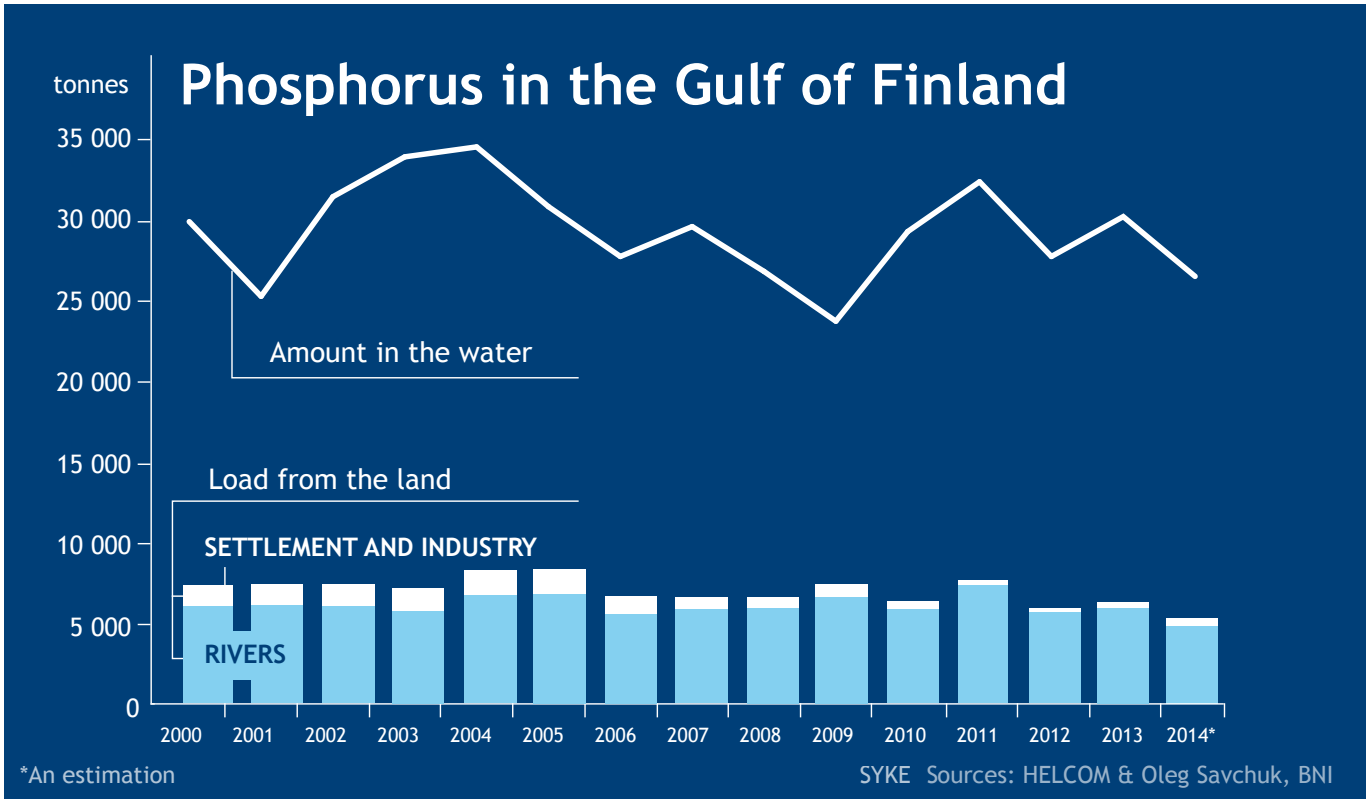


CYCLING OF PHOSPHORUS IN THE GULF OF FINLAND

Towards a healthier Gulf of Finland

- The amount of algae has decreased in the Gulf of Finland in the last ten years. This is mainly due to variability in the climatic conditions, which regulate the cycling of nutrients in the sea, but also to the reduction of the nutrient load. The effects of the decreased land-based nutrient load can best be seen in the eastern part of the gulf, where nutrient discharges have been reduced the most, and where the main basin of the Baltic Sea has a smaller impact compared to the western part.
- We must continue to reduce the amount of nutrients released to the sea. In order to reduce loads from diffuse sources, we must increase the recycling of nutrients in agriculture and increase the utilisation of manure. The use of fertilisers should correspond to the amount required for producing crops. The efficiency of nitrogen removal from urban waste water should be further improved in all countries, and special attention to the removal of phosphorus should be paid in Russia.
- International cooperation within the HELCOM and EU frameworks is an absolute necessity in the improvement of the environmental condition of the Baltic Sea and the Gulf of Finland. The cooperation on marine protection between Estonia, Finland, Russia, on the other hand, can take the special features of the Gulf of Finland and the specific administrative problems into account and address local environmental problems.

SYKE FINNISH ENVIRONMENT INSTITUTE | SYKE.FI | ENVIRONMENT.FI



THE AMOUNT OF PHOSPHORUS IN THE GULF OF FINLAND WATER FLUCTUATES CONSIDERABLY MORE THAN THE LAND-BASED PHOSPHORUS LOAD INTO THE GULF OF FINLAND. THE ANNUAL FLUCTUATIONS IN THE AMOUNT OF PHOSPHORUS IN THE GULF CAN BE EXPLAINED, TO A LARGE EXTENT, BY CHANGES IN CIRCULATION AND OXYGEN CONDITIONS WHICH ARE AFFECTED BY CLIMATIC FACTORS (WINDS AND DIFFERENCES IN AIR PRESSURE). AS A RESULT, THE MAIN BASIN OF THE BALTIC SEA AND THE INTERNAL PROCESSES OF THE GULF OF FINLAND AFFECT THE AMOUNT OF PHOSPHORUS IN THE GULF CLEARLY MORE THAN DOES THE LAND-BASED PHOSPHORUS LOAD.

Specific features of the Gulf of Finland slow down its recovery

The load of phosphorus from waste water to the Gulf of Finland has reduced significantly, particularly due to the renewal of the waste water treatment system of St. Petersburg in 2004–2015. The treatment systems for waste water of Helsinki and Tallinn had already been improved earlier.

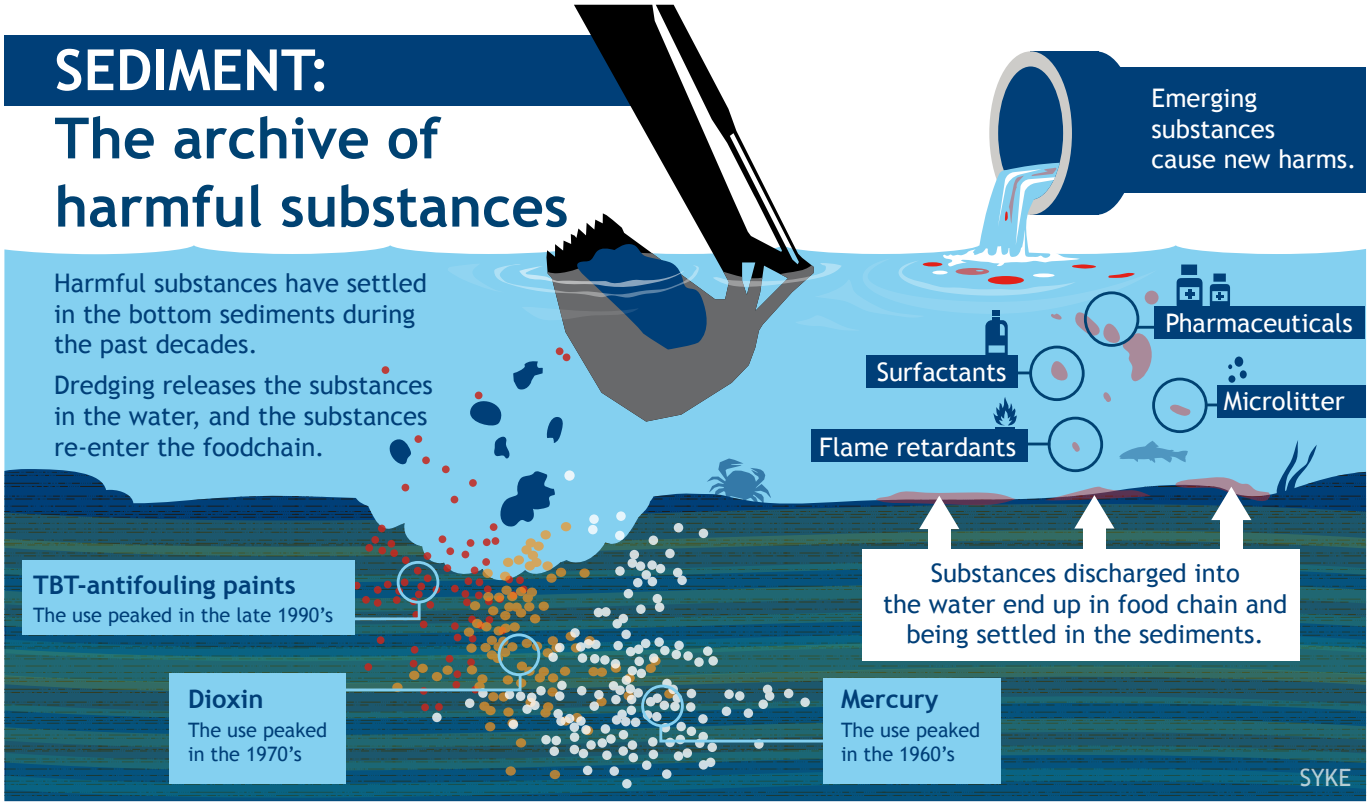
For the time being, a lowered phosphorus content of the water can only be seen in the eastern part of the gulf, because of lately-reduced nutrient load there. The phosphorus load from the River Luga was managed as late as 2012, which has likely slowed down the recovery in the eastern gulf. Changes in the phosphorus content in the western gulf can be explained by variability in circulation and oxygen conditions of the water.

The Gulf of Finland can be restored to an ecologically sustainable state if we implement the agreed reduction targets and use the gulf in a sustainable manner.

Land-based load both into the Gulf of Finland and the Baltic Proper should be reduced

The Gulf of Finland is sensitive to changes in the water exchange with the main basin of the Baltic Sea that are caused by climatic factors. We cannot affect the climate or the internal nutrient cycling that is typical of the gulf, thus we must ensure that the land-based load into the gulf will be minimized.

We will see fewer algal blooms and clearer waters only when we have managed to reduce the land-based load to an environmentally sustainable level. The reductions in the land-based load would also gradually lower the internal nutrient load. We should both reduce nutrient discharges into the Gulf of Finland and support processes that reduce emissions into the main basin of the Baltic Sea.



Threats to marine biodiversity

The Gulf of Finland is a sensitive brackish water area that is vulnerable to human activities. In addition to climate change and the nutrient loads, the ecosystem in the gulf is affected by harmful substances, intense maritime traffic and the exploitation of natural marine resources.

Eutrophication has a negative effect on species diversity, while it favours some species, such as the cyprinids. The effects of climate change, such as changes in the saline content and the rising water temperature, allow new invasive species to establish themselves in the gulf. Construction and dredging operations eradicate and damage marine habitats.

Emerging harmful substances in the spotlight

New harmful compounds, that are persistent and accumulate in the food chain, are constantly released into the Gulf of Finland. We do not recognize the sources and effects of these compounds well enough to be able to assess their degrading impact on the ecosystem.

In order to focus the measures on the most effective issues, we should analyse the sources, volumes and effects of chemicals released into waste water – particularly from industry and consumer products such as fire protection and surface treatment agents – and of pharmaceuticals and litter.

The human factor makes a difference in sea traffic

Sea traffic in the Baltic Sea is expected to increase by 30% in 2010–2030. More traffic means a higher risk of accidents, despite the advanced risk management measures.

A growing number of maritime accidents are caused by human error. Thus, ensuring the appropriate training and occupational well-being of people at sea has become vital. It is important to take the human factor into closer consideration when developing the safety at sea.

Salmon and trout populations have declined due to overfishing and the damming of rivers. The restoration of major salmon rivers would have a major impact on the revival of fish populations.

The Gulf of Finland still needs more action

Recommendations are based on the Gulf of Finland assessment, and the draft version of the Finnish Marine Strategy's Programme of Measures.

Reducing the land-based nutrient load

- Nutrient load from agriculture can be reduced by making the recycling of nutrients more efficient, fertilising the plants according to their growth requirements and using manure as fertiliser as appropriate. We should continue the experiments with binding nutrients into arable land with the help of gypsum amendment.
- The emission reductions specified in the Baltic Sea Action Plan by HELCOM, the EU Water Framework Directive, the EU Marine Strategy Framework Directive, and the Water Protection Programme of Northwest Russia are a necessity. Regional cooperation between Estonia, Finland, and Russia to improve the environmental condition of the Gulf of Finland supports the implementation.
- Reduction of the nutrient load from urban waste water continues to be important. It is also a chance to reduce the emissions of several harmful substances. Waste water treatment plants should be able to remove 70% of the nitrogen present in waste water from urban areas with more than 10,000 residents, and 90% in the case of larger cities whenever this is economically and technically feasible. Russia should further promote advanced phosphorus removal.
- Maritime nitrogen emissions to the Baltic Sea should be reduced, for example, by increasing the use of liquefied natural gas as ship fuel. Estonia, Finland, and Russia should join their forces at the negotiations of HELCOM and IMO[1] and promote the selection of the Baltic Sea as a NECA[2] area.

Fish, dredging and maritime traffic – risk minimisation and restoration

- We should support the natural reproduction of migratory fish stocks (particularly salmon, trout and river-spawning whitefish), particularly in major rivers, by removing migration barriers from the rivers and restoring the spawning and nursery grounds.
- The best available technology should be used to minimise the adverse effects of dredging and accompanying sediments. Large-scale dredging and dumping operations should always be agreed upon between the three countries, and the environmental impacts of these operations should be assessed in accordance with international regulations.
- Further analysis of and consideration for the human factor will make the risk forecasts in the maritime traffic more reliable.

Plans for the use of the Gulf of Finland need development

- The Gulf of Finland needs a marine spatial plan which would cover the waters of all three countries. Thanks to the plan, the natural resources in the Gulf of Finland could be used in a sustainable manner, and the plan would help minimising the detrimental effects of human activities on the marine ecosystem.
- The network of marine protection areas in the Gulf of Finland must be developed further within the HELCOM framework, taking into account the special features of the coastal ecosystems of Estonia, Finland and Russia.

Towards integrated monitoring and research

- HELCOM and the EU Marine Strategy Directive set the framework for the development and further integration of the monitoring of the Gulf of Finland, and for the exchange of monitoring data between the countries. The operational monitoring of the Baltic Sea on board merchant ships should be extended to cover the eastern Gulf of Finland. Regular wintertime monitoring in all parts of the Gulf of Finland is a prerequisite for a reliable assessment of eutrophication. We should improve the monitoring of riverine nutrient loads into the Gulf of Finland, for example, with the help of automation.
- In order to ensure the reliability of monitoring data, it is important that Estonia, Finland and Russia use high-quality environmental analytics and fully comparable monitoring methods that are in line with HELCOM's instructions. Similarly, the monitoring of loads to the Gulf of Finland should be based on HELCOM's guidelines. There is still some room for improvement in each of these areas.
- We need more research on the sources, routes, concentrations and detrimental ecosystem effects of pharmaceuticals and micro-plastic litter. Research and development efforts should be targeted towards methods for removing pharmaceuticals from waste water.

[1] *International Maritime Organization*
[2] *Nitrogen oxide Emission Control Area*

SYKE

Based on the Gulf of Finland assessment, produced by Estonian, Finnish and Russian researchers in the frames of the Gulf of Finland Year 2014 programme.

Authors SYKE / Marine Research Centre: Mika Raateoja, Kai Myrberg, Heikki Pitkänen and Jouni Lehtoranta.

Images: SYKE & Kaskas Media / Teemu Hotti | Layout: Erika Várkonyi.

ISBN 978-952-11-4539-1 (pbk.) | ISBN 978-952-11-4540-7 (pdf)

HELSINKI 2015.